REMARKS

The Examiner is thanked for the Interview courteously granted to the undersigned, in connection with the above-identified application. At the Interview, various amended claims were presented to the Examiner for discussion during the Interview. These amended claims included amendments to the claims (e.g., claim 1) to specify that the trench is formed with an upper end portion thereof having a curvature, and after burying the buried insulating film, the semiconductor substrate was oxidized so as to increase the curvature of the upper end portion of the trench. These amended claims also included amendments to claim 4 to specify that the trenches have upper end portions not covered by the oxidation prevention film, and that the upper end portions not covered by the oxidation prevention film are oxidized after the buried insulating film formed on the oxidation prevention film is removed. During the Interview, Examiner Wille indicated that the final film formed in, e.g., step (h) of claim 1 was more properly indicated as a gate oxide film, rather than gate oxidation film. In addition, Examiner Wille also indicated that the upper end portion at first did not have a curvature, and that, more properly, step (e) of claim 1 should specify that the oxidizing provided a curvature of the upper end portion of the trench, rather than "increased" the curvature.

During the above mentioned Interview, the undersigned discussed various differences between the present invention and the teachings of the applied references. In particular, and especially noting the teachings of Ooka, it was indicated by the undersigned that Ooka provides a heat treatment in order to smooth a required borophosphosilicate glass employed as the filler material in each trench, and alternatively can utilize N_2 or steam as the atmosphere for the heat treatment for the smoothing step; and that this disclosure would have neither taught nor would have suggested the oxidizing to provide a curvature of the upper end portion of the trench. In addition, it was contended by the undersigned that none of the references disclosed providing a curvature of the upper end portion of the trench, after burying the buried insulating film, particularly by oxidizing the semiconductor substrate.

It was also contended by the undersigned during the Interview that the teachings of the applied references do not disclose, nor would have suggested, the second oxidation to selectively oxidize the opening side of the completely filled trench regions in the substrate, as in claim 9; or wherein after the buried insulating film formed on the oxidation prevent film is removed, the semiconductor substrate is oxidized with upper end portions not covered by the oxidation prevention film being oxidized (see, e.g., claim 4).

In the Interview Summary by the Examiner, in connection with the Interview discussed previously, the Examiner indicates that Applicants assert "that even though the prior art [shows] every [step] of the claimed process, however, the references [fail] to show the features of the claims such as the curvatures". It is respectfully submitted, however, that Applicants, through the undersigned, did <u>not</u> indicate that the prior art showed every step of the claimed process. As indicated in the foregoing, and as will be set forth further in the following, the applied prior art would <u>not</u> have disclosed or suggested the steps of the claimed process, including, for example, the oxidizing step (e) of claim 1 (note also the oxidizing step (f) of claim 2 and step (c) of claim 15); or the step of providing the curvature of step (e) of claim 10; or the second oxidation to selectively oxidize, of step (e) of claim 9; or the oxidizing step (f) of claim 4 and of step (g) of claim 5, and advantages achieved thereby, as discussed in the following.

Applicants have amended their claims in light of comments by the Examiners during the above-discussed Interview, and in order to further clarify the definition of the present invention. Specifically, claims 1, 10 and 15 have been amended to recite that the trench has an upper end portion adjacent the circuit formation surface of the semiconductor substrate; and claims 1 and 10 have been further amended to recite that the trench is provided with a curvature

at an upper end portion after burying the insulating material, claim 1 specifying that the oxidizing provides such curvature, while claim 15 has been further amended to recite that the trench portion is oxidized so as to provide the upper end portion of the trench with a curvature. In addition, claim 4 has been amended to recite that the trenches have upper end portions not covered by the oxidation prevention film, and that the upper end portions not covered by the oxidation prevention film are oxidized. Claims 2 and 5 have been amended to recite that in oxidizing the semiconductor substrate after the buried insulating film formed on the oxidation prevention film is removed, the radius of curvature of the shallow trenches at the corners is increased. Claims 1, 2, 4, 5 and 9 have been amended to recite a gate "oxide" film, and claims 11-14, 16 and 17 have been amended in light of amendments to their parent claims.

In addition, Applicants are adding new claims 18-38 to the application. These new claims specify that the filling material is silicon oxide, that the silicon oxide is a deposited silicon oxide, and that this deposited silicon oxide is deposited by sputtering or chemical vapor deposition. See, e.g., the paragraph bridging pages 12 and 13 of Applicants' specification.

The undersigned notes the concurrently filed Request for Continued Examination, in connection with the above-identified application. It is respectfully submitted that the present amendments constitute the necessary

Submission, under 37 CFR §1.114, in connection with this Request for Continued Examination.

Applicants respectfully traverse the rejection of claims 10-14 and 15-17 under the second paragraph of 35 USC §112, as set forth in Item 1 on page 2 of the Office Action mailed January 26, 2001, particularly insofar as this rejection is applicable to the claims as presently amended. Thus, each of claims 10 and 15 has been amended to recite that the trench formed in step (b) has an upper end portion, and these claims have been further amended to recite that the upper end portion of the trench is provided with a curvature. Accordingly, as presently amended, it is respectfully submitted that the claims recite creation of the curvature, and that recitation of the curvature is <u>not</u> indefinite.

Applicants respectfully submit that all of the claims now presented for consideration by the Examiner patentably distinguish over the teachings of the references as applied by the Examiner in rejecting the claims formerly in the application, that is, the teachings of the U.S. patents to Ooka, No. 4,740,480, to Perera, No. 5,786,263, and to Fazan, et al., No. 5,433,794, and European Patent Application No. 459,397A2 (Miyashita), under the provisions of 35 USC §102 and 35 USC §103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a method of

fabricating a semiconductor device as in the present claims, including, inter alia, forming a trench having an upper end portion adjacent a circuit formation surface of a semiconductor substrate; and after oxidizing a trench portion formed in the semiconductor substrate exposed in the trench and burying a buried insulating film into the trench, oxidizing the semiconductor substrate so as to provide the upper end portion of the trench with a curvature.

More generally, it is respectfully submitted that these references would have neither taught nor would have suggested such a method of fabricating a semiconductor device as in the present claims, including forming the specified trench having an upper end portion thereof extending to a circuit formation surface of a semiconductor substrate, and after oxidizing a trench portion formed in the substrate and burying a buried insulating film into the trench, providing the upper end portion of the trench with a curvature.

In addition, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a semiconductor substrate fabrication method, or such semiconductor device fabrication method, as in the present claims, including after forming shallow trenches having a radius of curvature at specified corners thereof and forming trenches having a predetermined depth in these shallow trenches having the radius of curvature, oxidizing trench portions exposed in the trenches and burying

a buried insulating film into the trenches, and oxidizing the substrate so as to increase the radius of curvature of the shallow trenches at the aforementioned corners (see claims 2 and 5); and, further, before oxidizing so as to increase the radius of curvature, removing the buried insulating film on the oxidation prevention film (see claim 5).

Moreover, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such method of fabricating a semiconductor device as in claim 4, wherein after forming the trenches having upper end portions not covered by an oxidation prevention film on the semiconductor substrate, and then oxidizing trench portions exposed in the trenches and burying a buried insulating film into the trenches, oxidizing the semiconductor substrate after the buried insulating film on the oxidation prevention film is removed, so that upper end portions not covered by the oxidation prevention film are oxidized.

In addition, the applied references would have neither taught nor suggested the method of claim 15, including oxidizing a trench portion exposed in the trench to provide the upper end portion of the trench with a curvature, and after such oxidizing, burying a buried insulating film in the trench and removing the buried insulating film formed on an oxidation prevention film on the substrate.

Furthermore, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such method of fabricating a semiconductor device as in the present claims, including performing the second oxidation to selectively oxidize an opening side of the completely filled trench regions in the substrate. See claim 9.

In addition, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested the other aspects of the present invention, as in, e.g., the remaining, dependent claims, including (but not limited to) wherein providing the curvature includes thermally oxidizing the upper end portion of the trench (see claim 11; note also claim 17); and/or wherein the oxidizing for providing the curvature includes forming bird's beaks at the upper end portion of the trench (see claim 12; note also claim 16); and/or wherein the curvature is provided such that an angle between the circuit formation surface of the substrate and a side surface of the substrate forming the trench is within a range of $90° < \theta < 180°$ (see claim 13); and/or wherein the curvature is provided after removing the buried insulating film (see claim 14); and/or wherein the buried insulating material is a silicon oxide material, in particular a deposited silicon oxide, and especially wherein the deposited silicon oxide is deposited by sputtering or chemical vapor deposition (see claims 18-38).

The invention as presently claimed in the above-identified application is

directed to a method of manufacturing a semiconductor substrate, or semiconductor device, having a trench isolation structure. A so-called "trench isolation structure" made by a selective oxidation method, which forms trenches extending into the substrate from the substrate surface and then selectively oxidizes the trenches to form a thermal oxide film, has been employed as the insulation/isolation structure of semiconductor devices, as described in the paragraph bridging pages 1 and 2 of Applicants' specification.

In the trench isolation structure, end points (corner points) essentially exist near the trench upper end portion of the semiconductor substrate. A stress concentration field is formed near the end points. Because such a stress concentration field is formed, the shape of the substrate, particularly near the trench upper end portion, is oxidized in some cases into a pointed shape having an acute angle, as shown in Fig. 1C of Applicants' disclosure. If such an acute angle portion 4 remains on the semiconductor surface, however, concentration of electric field occurs at this portion during the circuit operation and deteriorates the breakdown voltage characteristics of transistors, capacitors, etc., formed utilizing such substrate. See the paragraph bridging pages 3 and 4 of Applicants' specification.

Against this background, Applicants provide a process wherein trench isolation can be utilized, without causing deterioration of breakdown voltage

characteristics of transistors and capacitors utilizing the substrate with the trench isolation structure, while providing semiconductor devices having a high reliability. Moreover, Applicants fabricate such structure utilizing a relatively simple technique.

Applicants have found that the desired structure can be achieved by preventing a substrate shape in the proximity of the upper end portion of the device isolation trench from becoming an acute angle; and, by the present invention, provide simple techniques for preventing such acute angle. Specifically, according to the present invention, Applicants provide various processing procedures which can easily and effectively provide a curvature of an upper end portion of the trench, so as to prevent the aforementioned acute angle. For example, and specifically, according to the present invention, after burying the buried insulating film, the semiconductor substrate can be oxidized. Moreover, the semiconductor substrate can be oxidized after the buried insulating film formed on the oxidation prevention film is removed. Moreover, more generally, after burying the buried insulating film, an upper end portion of the trench can be provided with the curvature. This prevention of the acute angle can be achieved, for example, by thermal oxidation of the upper end portion of the trench; e.g., by forming bird's beaks at the upper end portion of the trench.

As is clear according to the specification of the present application, since the buried insulating film 9 (see, e.g., Fig. 2(g)) has already been formed inside the trench of the silicon substrate 1, oxidation proceeds from near the trench upper end portion 12, and the inside of the trench is hardly oxidized. That is, a longer time is necessary for oxidation seeds to diffuse inside the buried insulating film 9 before reaching the silicon substrate 1, than when the silicon substrate is directly oxidized. Therefore, oxidation hardly proceeds substantially near the bottom of the trench. On the other hand, a weak boundary layer of the coupling portion deposited by chemical vapor deposition or sputtering to the trench side walls and the upper surface of the trench exists at the trench upper end portion 12, and oxidation seeds can diffuse at a relatively high rate along this weak boundary layer. As a result, oxidation seeds are supplied to the trench upper end portion 12 within a short time, so that only the portions in the proximity of the trench upper end portion 12 are oxidized preferentially and the formation of the radius of curvature of the trench upper end portion 12 is promoted. Note, for example, the paragraph bridging pages 14 and 15 of Applicants' specification.

Ooka discloses a method of producing a semiconductor device, for providing an isolation structure among circuit elements in an integrated circuit device. The method includes the steps of forming a protecting layer on a semiconductor substrate, selectively removing the protecting layer and the

semiconductor substrate to form a plurality of trenches; forming a glass layer containing both boron silicate and phosphorus silicate to cover the protecting layer and to fill each trench; fusing the glass layer containing both boron silicate and phosphorus silicate to provide a smoothly contoured surface thereof; selectively etching the glass having the smoothly contoured surface to leave a portion of the glass layer which fills each trench; removing the protecting layer; fusing the remaining glass layer filling each trench to make the surface thereof round; and forming a plurality of circuit elements in portions of the semiconductor substrate isolated by the trenches. See column 2, lines 14-31. Note further column 2, lines 35-48, emphasizing the importance of using a borophosphosilicate glass as a material to fill each trench. In column 5, lines 19-68, of Ooka there is disclosed a specific embodiment for forming the structure. This embodiment includes a step of subjecting the structure, after filling up the trench with a borophosphosilicate glass layer, to a heat treatment in N_2 or a steam atmosphere for 30 minutes, to fuse the borophosphosilicate glass film and form a very smoothly contoured surface. Note especially column 5, lines 46-50.

It is respectfully submitted that this disclosure of Ooka would have neither taught nor would have suggested the present invention, including, inter alia, the oxidizing of the trench portion exposed in the trench, after burying the buried insulating film so as to increase the radius of curvature (or to provide a curvature)

of upper end portions; or oxidation of the substrate after burying the buried insulating material to oxidize upper end portions not covered by the oxidation prevention film; or the selective oxidation of an opening side of the completely filled trench regions, as in the present invention, or the other aspects of the present invention as discussed previously.

Clearly, Ooka requires a borophosphosilicate glass film, as a material filled into each trench, in order to achieve a purpose set forth in Ooka. This patent would have neither taught nor would have suggested, and in fact would have taught away from, silicon oxide as the buried insulating material, and advantages achieves through use of this buried insulating material including, for example, selective oxidation at the upper end portions of the trench providing the curvature at the upper end portions which achieves the advantages of the present invention.

The contentions by the Examiner that Ooka oxidizes the semiconductor substrate, after burying the buried insulating film, and that, e.g., Ooka would inherently increase the curvature, form bird's beaks and have an angle as claimed, are respectfully traversed. Note that Ooka discloses, alternatively, in a first embodiment, a heat treatment in N_2 or steam atmosphere to fuse the borophosphosilicate glass film to flow. Of course, using an N_2 atmosphere, oxidation would not occur. In addition, note that the steam atmosphere as

described in Ooka is disclosed without description of amount of steam in the atmosphere; it is respectfully submitted that at relatively low concentrations of steam, there would be no substantial oxidation providing the curvature according to the present invention.

In addition, it is again emphasized that Ooka discloses heat treatment to fuse the borophosphosilicate glass film and does not disclose providing curvature, much less that providing the curvature achieves unexpected results of avoiding deteriorated breakdown voltage characteristics of devices formed. Thus, it is respectfully submitted that Ooka would have neither taught nor would have suggested the presently claimed subject matter, or advantages achieved thereby.

It is again emphasized that Ooka discloses, alternatively, heat treatment in steam or N_2 atmosphere. As can be appreciated from the foregoing, according to the present invention utilizing the oxidation, or, more generally, providing the curvature at the upper end portions of the trenches, unexpectedly better results are achieved in avoiding deterioration of breakdown voltage, through increasing radius of curvature at upper end portions of the trench isolation. It is respectfully submitted that Ooka does not disclose nor would have suggested providing the curvature or unexpected results achieved thereby, and clearly would have neither disclosed nor would have suggested the presently claimed invention.

The additional contention by the Examiner in connection with claim 9, that Ooka discloses selective oxidation of an opening side of the completely filled trench regions in the substrate, is respectfully traversed. The Examiner has pointed to no portion of Ooka as disclosing such selective oxidation. It is respectfully submitted that Ooka does not disclose, nor would have suggested, the selective oxidation, or advantages achieved thereby.

It is respectfully submitted that the additional teachings of Miyashita or Perera, as applied in combination with the teachings of Ooka, would not have rectified the deficiencies of the teachings of Ooka, such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Perera discloses a method for forming a trench isolation structure in an integrated circuit, including forming a trench; and thereafter forming a silicon layer lying within the trench and overlying an oxidation resistant layer on the substrate. The silicon layer is then completely oxidized in an ambient including oxygen to form a first dielectric layer that lies within the trench, this first dielectric layer having a thickness insufficient to fill the trench. A second dielectric layer is formed overlying the first dielectric layer and substantially filling the trench. Note column 2, line 28 to column 3, line 47.

Even assuming, arguendo, that the teachings of Ooka and Perera were properly combinable, such combined teachings would have neither taught nor would have suggested the presently claimed subject matter, including the oxidizing to form the curvature, and advantages achieved thereby as discussed previously.

Miyashita discloses a method of fabricating a semiconductor device having device isolation made by a trench formed in the semiconductor substrate, the process including a first step of forming a device-isolating trench with a taper of an upper portion thereof, in a semiconductor substrate, and a second step of forming an oxide film on an inner wall of the trench and a surface of the substrate near the trench by an oxidizing method. See the paragraph bridging columns 1 and 2 of this patent document. Note also column 2, lines 53-58; column 3, lines 4-12, 17-25, 33-39 and 42-46; and column 4, lines 39-54.

Even assuming, arguendo, that the teachings of Miyashita were properly combinable with the teachings of Ooka, it is respectfully submitted that the combined teachings of the references would have neither disclosed nor would have suggested, and in fact would have taught away from, the presently claimed subject matter, including providing the curvature after filling the trench, and especially wherein the curvature is provided by an oxidation step, and advantages achieved thereby, as discussed in the foregoing.

It is respectfully submitted that the teachings of Fazan et al., even in combination with the teachings of the secondary references as applied by the Examiner, would have neither taught nor would have suggested the presently claimed subject matter. Fazan et al. discloses formation of trenches useful in isolating active areas on a semiconductor substrate, to solve the corner effects problem found with trench isolated structure and to smooth the wafer surface, by adding spacer forming steps to the process. The process of Fazan et al. includes forming the trench and then forming spacers around the periphery of the trench. These spacers then combine with isolation material disposed in the trench to form a dome-like structure over the trench, the cover extending over peripheral edges of the trench thereby limiting the effect of the corners. Note particularly column 1, lines 37-51. See also column 2, lines 37-42.

As can be seen from the foregoing, as well as from a full review of Fazan et al., this patent recites a relatively complicated procedure including admittedly additional spacer-forming steps, in order to solve the corner effects problem. This patent does not disclose, nor would have suggested, the presently claimed process, including, inter alia, oxidizing the substrate after providing the buried insulating film so as to increase radius of curvature of the shallow trenches at the corners (see claim 5); or the oxidation of upper end portions of the trenches not

covered by the oxidation prevention film, achieving increased radius of curvature and advantages according to the present invention as discussed previously.

It is respectfully submitted that the secondary references as applied by the Examiner in combination with Fazan et al. would not have rectified the deficiencies of Fazan et al. such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art. Miyashita and Perera have been previously discussed. Even assuming, arguendo, that the teachings of Perera, or both of Perera and Miyashita, were properly combinable with the teachings of Fazan et al., the combined teachings of these references would have neither taught nor would have suggested the presently claimed subject matter, including oxidation of upper end portions of the trenches not covered by the oxidation prevention film, after the buried insulating film formed on the oxidation prevention film is removed; or oxidizing the substrate after the buried insulating film formed on the oxidation prevention film is removed, so as to increase radius of curvature of shallow trenches at corners in desired positions of the circuit formation surface of the substrate.

It is emphasized that according to aspects of the present invention, oxidation is performed with, e.g., the trench filled, so that oxidation occurs along the trench surface at upper corners of the trench (whereby oxygen need only move a short distance) and substantially not at bottom surfaces of the trench.

Thus, upper surfaces of the trench can be provided with a curvature, utilizing simple procedures, achieving advantages according to the present invention.

Attached hereto is a marked-up version of the changes made in the claims by the current Amendment. This marked-up version is on the attached pages, the first page of which is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

In view of the foregoing comments and amendments to the claims, entry of the present amendments, and reconsideration and allowance of all claims remaining in the application, are respectfully requested.

To the extent necessary, applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (500.36515VX1) and please credit any excess fees to such deposit account.

Respectfully submitted,

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ATTACHMENT A

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend the claims as indicated below:

1. (Twice Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming a trench having a desired depth at a predetermined position of the circuit formation surface of said semiconductor substrate, said trench having an upper end portion adjacent the circuit formation surface of the semiconductor substrate;

(c) oxidizing a trench portion formed in said semiconductor substrate, exposed in said trench;

(d) burying a buried insulating film into said trench so oxidized;

(e) after burying said buried insulating film, oxidizing said semiconductor substrate so as to provide a curvature of the upper end portion of the trench;

(f) removing said buried insulating film formed on said oxidation prevention film;

(g) eliminating said oxidation prevention film formed on said semiconductor substrate; and

(h) after said eliminating, forming a gate [oxidation] <u>oxide</u> film.

2. (Twice Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming shallow trenches having a radius of curvature at corners in a desired position of the circuit formation surface of said semiconductor substrate;

(c) forming trenches having a predetermined depth to said shallow trenches having a radius of curvature so formed;

(d) oxidizing trench portions formed in said semiconductor substrate, exposed in said trenches;

(e) burying a buried insulating film into said trenches so oxidized;

(f) oxidizing the semiconductor substrate after burying said buried insulating film<u>, so as to increase the radius of curvature of the shallow trenches</u>;

(g) removing said buried insulating film formed on said oxidation prevention film;

(h) eliminating said oxidation prevention film formed on said semiconductor substrate; and

(i) after said eliminating, forming a gate [oxidation] oxide film.

4. (Twice Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming trenches having a predetermined depth at desired positions of the circuit formation surface of said semiconductor substrate, said trenches having upper end portions not covered by said oxidation prevention film;

(c) oxidizing trench portions formed in said semiconductor substrate, exposed in said trenches;

(d) burying a buried insulating film into said trenches so oxidized;

(f) oxidizing said semiconductor substrate after said buried insulating film formed on said oxidation prevention film is removed, said upper end portions not covered by said oxidation prevention film being oxidized;

(g) removing said oxidation prevention film formed on the circuit formation surface of said semiconductor substrate; and

(h) after said oxidizing said semiconductor substrate, forming a gate [oxidation] <u>oxide</u> film.

5. (Twice Amended) A method of fabricating as semiconductor substrate comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming shallow trenches having a radius of curvature at corners in desired positions of the circuit formation surface of said semiconductor substrate;

(c) forming trenches having a predetermined depth in said shallow trenches having a radius of curvature;

(d) oxidizing trench portions formed in said semiconductor substrate, exposed in said trenches;

(e) burying a buried insulation film into said trenches so oxidized;

(f) removing said buried insulating film formed on said oxidation prevention film;

(g) oxidizing said semiconductor substrate after said buried insulating film formed on said oxidation prevention film is removed<u>, so as to increase the radius of curvature of the shallow trenches at said corners</u>;

(h) removing said oxidation prevention film formed on the circuit formation surface of said semiconductor substrate; and

(i) after said oxidizing said semiconductor substrate, forming a gate [oxidation] oxide film.

9. (Twice Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate,

(b) forming trench regions in said substrate from said circuit formation surface thereof,

(c) performing a first oxidation to form an oxide film on said trench regions formed in step (b), and

(d) forming an insulating film inside said oxidized trench regions so as to completely fill them,

characterized by further steps of:

(e) performing a second oxidation to selectively oxidize an opening side of said completely filled trench regions in said substrate; and

(f) after performing the second oxidation, forming a gate [oxidation] oxide film.

10. (Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming a trench having a desired depth at a predetermined position of the circuit formation surface of said semiconductor substrate, the trench having an upper end portion thereof extending to the circuit formation surface of the semiconductor substrate;

(c) oxidizing a trench portion formed in said semiconductor substrate, exposed in said trench;

(d) burying a buried insulating film into said trench so oxidized;

(e) after burying said buried insulating film, [increasing a curvature of an] providing the upper end portion of said trench with a curvature;

(f) removing said buried insulating film formed on said oxidation prevention film; and

(g) removing said oxidation prevention film formed on the circuit formation surface of said [circuit] semiconductor substrate.

11. (Amended) A method of fabricating a semiconductor device according to claim 10, wherein said [increasing] providing the curvature includes thermally oxidizing the upper end portion of the trench.

12. (Amended) A method of fabricating a semiconductor device according to claim 10, wherein said [increasing] providing the curvature includes forming bird's beaks at the upper end portion of the trench.

13. (Amended) A method of fabricating a semiconductor device according to claim 10, wherein said [increasing] providing the curvature is performed such that an angle (θ) between the circuit formation surface of the semiconductor substrate and a side surface of the semiconductor substrate forming the trench is within a range of $90° < \theta < 180°$.

14. (Amended) A method of fabricating a semiconductor device according to claim 10, wherein said [increasing] providing the curvature is performed after said removing said buried insulating film.

15. (Amended) A method of fabricating a semiconductor device comprising the steps of:

(a) forming an oxidation prevention film on a circuit formation surface of a semiconductor substrate;

(b) forming a trench having a desired depth at a predetermined position of the circuit formation surface of said semiconductor substrate, the trench having an upper end portion thereof extending to the circuit formation surface of the semiconductor substrate;

(c) oxidizing a trench portion formed in said semiconductor substrate, exposed in said trench, so as to [increase a curvature of the semiconductor substrate of an] provide the upper end portion of said trench with a curvature;

(d) burying a buried insulating film into said trench so oxidized;

(e) removing said buried insulating film formed on said oxidation prevention film; and

(f) removing said oxidation prevention film formed on the circuit formation surface of said circuit substrate.

16. (Amended) A method of fabricating a semiconductor device according to claim 15, wherein said oxidizing said trench portion forms a bird's beak at the upper end portion of said trench, so as to [increase] provide said curvature.

17. (Amended) A method of fabricating a semiconductor device according to claim 15, wherein said oxidizing is a thermal oxidation, so as to [increase] <u>provide</u> said curvature.